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(71) Applicant *(for all designated States except US)*: TRANS-ALARM LIMITED [GB/GB]; Moss side Industrial Estate, Callington, Cornwall PL17 7DU (GB).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)* : MORGAN, Barry [GB/GB]; 22 The Butts, Tintagel, Cornwall PL34 0AT (GB). YANDELL, John [GB/GB]; Netley House, Harrowbarrow, Callington PL17 8BG (GB).

(74) Agent: BRYER, Kenneth, Robert; Hepworth Lawrence Bryer & Bizley, Lewins House, Lewins Mead, Bristol BS1 2NN (GB).

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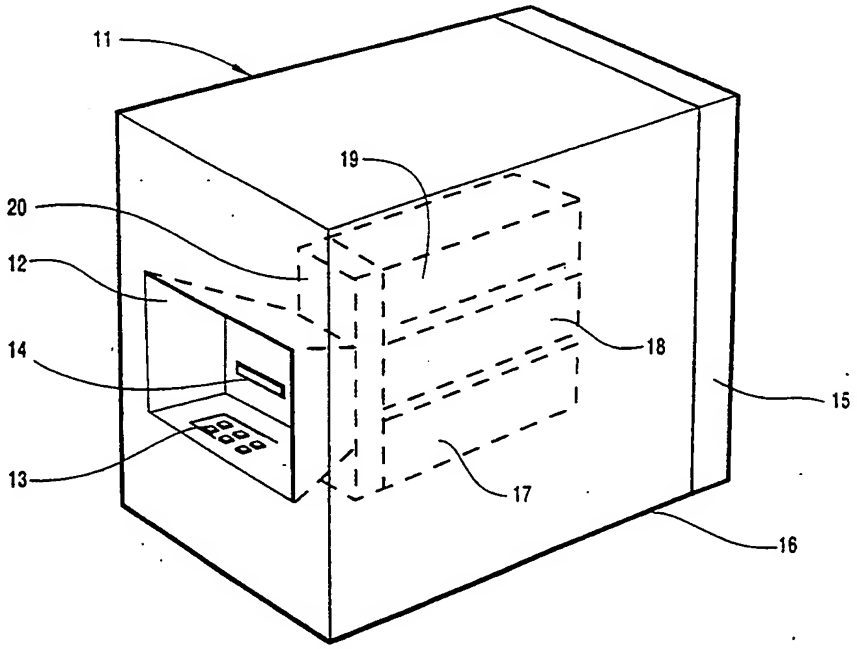

(57) Abstract

Apparatus for contaminating valuables such as bank notes or other documents held in one or a plurality of containers removably mounted within a housing, by delivering contamination material into each container from a reservoir thereof via a contaminant delivery system when a valve is opened, in which the housing is a lockable secure enclosure, the reservoir and the delivery system are housed wholly within the said secure enclosure but outside the or each said container, and a sensor for detecting forced entry into the housing is located within the said secure enclosure and operable, when triggered by an attempt at forced entry into the housing, automatically to open the said valve and release contaminant into the or each individual removable container whereby to contaminate the contents thereof, and a trigger operating mechanically to release the dye from a reservoir.

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DOCUMENT INVALIDATION APPARATUS AND TRIGGER FOR OPERATION THEREOF

The present invention relates generally to document invalidation apparatus, and particularly to apparatus for invalidating valuable documents such as airline tickets, bearer bonds, bank notes or other securities by contaminating them with a visible or invisible contaminant fluid: the present invention also relates to a trigger for a securiy system.

In the continuing battle against crime, it is necessary to develop improvements in security systems which are adapted to counter novel attempts by criminals to perpetrate fresh crimes. Traditionally, valuable items such as bank notes, security certificates, airline tickets and the like are maintained in a strong box or safe when unsupervised. Recently, automatic machines for dispensing bank notes to the public have become increasingly used. Such machines, known as automatic teller machines (ATM) are placed within a secure environment such as a bank or building society office, and have an opening accessible to the public connected electronically to computing apparatus for recording transactions conducted via the use of magnetic code recordings on plastic cards. Because of their popularity it has become necessary to increase the capacity of ATMs,

especially to accommodate the heavy period of use over a weekend between successive periods when they can be refilled. Because they house a very large quantity of bank notes when filled these machines have received the attention of criminals. Naturally, such machines are made highly secure by means of a rigid strong metal structure of great weight and strength. Nevertheless, an access opening must be provided for loading the bank notes, and it is the junction line of this access opening which has been the subject of attack.

Although it will hereinafter be described in relation to its use on ATMs, the present invention is also applicable to other security enclosures such as strong boxes or safes and the following description of the specific application is given without prejudice to the generality of the invention.

It has been found that the techniques most likely to be used to attack an ATM comprise the use of drilling or grinding equipment on the heavy metal casing or the use of steel wedges at the junction of the closure to the loading opening, or the use of explosives placed in the first place in the small space between the opening and the closure seeking to deform the loading opening to allow access for more explosive.

Our earlier UK patent application number 8813874.8 (continued as European patent application number

89305714.1) describes a self-contained security system operable to sense any attempt at forcible entry into a safe or strong box, including attempts to move the safe or strong box away from its location, which reacts to such attempts by releasing a non-drying dye onto the contents thereby devaluing them. The sensor described in our earlier patent application has an entirely self-contained power supply so that it can be enclosed within the safe and is therefore inaccessible to intending thieves whereby to prevent any attempt at disablement. The sensor of this earlier device operates electronically to detect any one of a range of attempts at forcible entry. Unfortunately, the use of explosives to force open a door can generate a shock wave which can damage sensitive electronic apparatus more rapidly than its response time so that even though the system may be operating properly, it may nevertheless be prevented from releasing the contaminating dye by the damage inflicted by an explosive charge. In order to overcome this disadvantage the present invention, in one aspect, proposes the use of a mechanical pressure-sensitive trigger which is sufficiently robust to resist damage by shock waves generated by explosives. In this way, even a relatively large detonation of an explosive charge nevertheless results in reliable operation of the trigger to initiate the alarm and/or to institute remedial action such as the release of contaminants to invalidate or devalue the contents.

Other systems for effecting such invalidation are known. For example European Patent application No 166,939 describes a system for marking bank notes in the event of a theft or hold-up, comprising a source of compressed air and an electromagnetic sensor operable to open a valve and allow the compressed air to be directed past a plurality of apertures causing a contaminant dye to be drawn through the apertures by the ejector principle. The contaminant dye is invisible, but oxidises to a visible condition some sixty minutes after having been exposed to the air. Another device for invalidating bank notes is described in French Patent 2,572,907. This device is different from that described above in that the bank notes are held in a cassette within the apparatus and, upon detection of an attempted break in, the bank notes are rapidly transported from the cassette past a printer or perforator at which each is individually invalidated. This latter system has the disadvantage that it requires a certain amount of time for operation and a rapid and successful attempt to open a safe containing such a system may be able to frustrate the attempt at invalidation by removing at least some of the bank notes prior to their individual transport past the invalidation station.

One of the major difficulties encountered in designing a system for invalidating valuable documents such as bank notes lies in the difficulty of ensuring that the entire

contents of a secure enclosure such as a safe or an automatic teller machine are reliably contaminated in a very short space of time upon detection of an attempt at forcible entry. This problem is particularly acute in the case of automatic teller machines since the bank notes are closely packed in enclosed cassettes in which there is little spare space for the introduction of security systems.

Because each cassette is separately removable from an automatic teller machine for refilling the problem of gaining access to the contents for contamination in the event of an attempted theft is particularly acute and the cost of providing individual contaminator systems for each cassette, involving the duplication of the sensors and associated mechanism for effecting delivery of the contaminant, as well as the limited space for an adequate reservoir of contaminant has resulted in there being no satisfactory system available on the market at present.

The present invention seeks to overcome these difficulties by providing a security system capable of delivering a contaminating fluid to a plurality of containers or cassettes from a point outside the container or cassette, whilst nevertheless reliably delivering sufficient contaminant under an adequate pressure to ensure that the entire contents of the cassette are contacted by the contaminant to render them

valueless.

The present invention seeks, therefore, to provide a security system for contaminating the contents of a secure enclosure which requires no external electrical or other power supply and which is capable of responding rapidly to release contaminating dye in large quantities immediately upon detection of any attempt at forced entry into the enclosure.

According to one aspect of the present invention therefore, there is provided apparatus for contaminating valuables such as banknotes or other documents held in one or a plurality of containers removably mounted within a housing, by delivering contamination material into each container from a reservoir thereof via a contaminant delivery system when a valve is opened, in which the housing is a lockable secure enclosure, the reservoir and the delivery system are housed wholly within the said secure enclosure but outside the or each said container, and a sensor for detecting forced entry into the housing is located within the said secure enclosure and operable, when triggered by an attempt at forced entry into the housing, automatically to open the said valve and release contaminant into the or each individual removable container whereby to contaminate the contents thereof.

According to another aspect of the present invention

there is provided apparatus for contaminating valuables such as bank notes held in a secure enclosure upon detection of an attempt to force an entry into the enclosure, comprising sensor means for detecting an attempted forced entry and means for releasing a contaminating fluid from a source thereof, in which the sensor is entirely mechanical and requires no electrical or other power supply.

In a preferred embodiment of the invention the contaminant delivery system is likewise entirely mechanical.

The apparatus of the present invention may be particularly adapted for delivery of contaminant fluid to a plurality of separate cassettes, in which case the contaminant delivery system may have a plurality of outlets for rapid distribution of contaminant fluid to a plurality of containers or cassettes within the main enclosure. Such a delivery system may, for example, include a plurality of nozzles each adapted to deliver contaminant fluid from a common source through an opening in the associated container or cassette.

The contaminant fluid may be any one of a number of fluids either gas or liquid, capable of detection on the valuables such as to devalue them. In the majority of cases the most suitable contaminant may be a liquid or

gaseous dye, preferably a non-drying dye capable of impregnating any porous material. Alternatively, however, the contaminant may be an adhesive or glue, especially a rapid drying glue, or a chemical agent which will destructively attack the material to render it valueless. Without prejudice to the generality thereof the present invention will hereinafter be described with reference to the use of a contaminant liquid dye.

By providing a reservoir of contaminating dye outside the containers, and a plurality of delivery nozzles, it is possible to utilise a relatively large quantity of dye which, typically, is held under pressure within the reservoir and released by opening a mechanically actuated valve thereby obtaining very quickly delivering a large quantity of the contaminating fluid into the subsidiary enclosure or cassettes. This is critical in ensuring that all the contents of the cassettes are adequately and permanently contaminated. Because the cassettes are removable for refilling the contaminating system of the present invention is provided with means for automatic coupling of the delivery nozzles to the cassettes upon repositioning of the cassette or the contaminating system within the enclosure prior to closing the door. This may be achieved, for example, by positioning the contaminating system within the enclosure at such a location that the nozzle is contacted by an opening in the subsidiary enclosure or cassette as this is

positioned, for example by sliding it onto a rack. In many circumstances, however, there is inadequate space in an existing automatic teller machine for positioning such a system, in which case a movable dye delivery system may be provided between the cassettes and the door. In order to avoid the possibility of the contaminating system being inadvertently omitted upon repositioning of the cassettes this system is preferably permanently connected to the casing, for example by hinges, so that it can be pivoted out of its working position to allow removal of the cassettes but must be returned to its working position before the door can be closed. In one embodiment of the invention the nozzle or nozzles for connection to the subsidiary enclosure or cassette are formed as conically tapered nozzles which automatically align with the opening in the subsidiary enclosure or cassette upon repositioning of the cassette or the system as appropriate.

The sensor operable to trigger release of the contaminating dye upon attempted forcible opening of the machine may, according to another aspect of the invention comprise a flexible laminar element held in a curve in a first direction by support means engaging the convex face of the element whereby to resist further curvature due to the biasing force exerted longitudinally of the element by biasing means, and means for shielding the concave face of the element from ambient pressure variations such

that an increase in an ambient pressure beyond a threshold value determined by the characteristics of the laminar element and the value of the said biasing force causes the laminar element to flex in the opposite direction thereby releasing it from the support and allowing displacement of the biasing means.

The flexible laminar element of the pressure sensitive trigger of the present invention may be of any suitable form although, as will be described in relation to the specific embodiment, it is preferable that this element has an elongate form and the preferred embodiment of the invention is provided with a flexible laminar element in the form of an elongate strip.

The flexible laminar element may be made of any suitable material and it has been found that a resilient plastics material such as a glass reinforced plastics (GRP) is suitable in providing the required strength and resistance in an element of convenient dimensions. The flexible laminar element may, however, be made of other materials such as flexible metal strip and it is envisaged that elements made of flexible metal such as spring brass, spring steel or phosphor bronze will be suitable.

The means for shielding the concave face of the laminar element from ambient pressure variations preferably

comprises an enclosure defining a cavity of which the said concave face defines one wall or a part thereof. This configuration has particular advantages since the provision of such a cavity makes it possible for the flexible laminar element to be deflected by pressure variations or a shock wave regardless of the direction from which such pressure variations or such shock waves emanate. In this way, therefore, the trigger is effectively omni-directional.

The enclosure preferably comprises a casing surrounding the flexible laminar element and having openings communicating with the convex face thereof. These openings may comprise a relatively small number of large openings or a relatively large number of small openings: for example, the appropriate wall of the casing and/or the support means for the flexible laminar element may be a mesh or other form of pierced or perforated sheet.

It is envisaged that the support means may be formed separately from the casing and be removable therefrom although it is possible to devise embodiments of the invention in which the support means itself forms part of the casing.

The longitudinal biasing force exerted on the flexible laminar element may be generated by biasing means comprising, for example, a resilient biasing member such

as a spring, or may alternatively be generated by compressed gas acting, for example, on one end of a plunger or piston the other end of which engages the said flexible laminar element.

Although the parameters required for any particular situation may be known in advance, thereby allowing the trigger to be produced at the factory with the required characteristics, it may be convenient for this to be made adjustable in order to allow it to be set up in the field, upon installation in the ATM or safe in which it is to be housed, in which case the force exerted by the biasing means may be made adjustable to vary the sensitivity of the trigger. Such variation may be achieved by making the curvature of the flexible laminar element variable (which almost inevitably would mean a variation in the curvature of the support member as well, and the force exerted by the biasing means may also be variable which, again, would allow a variation in the sensitivity of the trigger.

Although the supporting member may be formed as an element engaging a major part of the convex face of the flexible laminar element, embodiments may be formed in which the support contacts only a minor part of the convex face and, particularly, the support may be made as a plurality of transverse elements in the form of rods or bars contacting the convex face of the element and

holding it into a curve with the number of supports being sufficient, in relation to the stiffness of the laminar element to prevent it from flexing further.

The security system of the invention may include means for detecting other physical parameters indicative of an attempted forced entry, such sensors being operable to cause detonation of an explosive charge upon detection of these parameters whereby to initiate operation of the pressure sensitive trigger. Such an explosive charge would, of course, be rather small, merely being intended to generate a shock wave sufficient to operate the trigger. Means for detecting the said other physical parameters may include means sensitive to movement of the enclosure, means sensitive to temperature within or in the vicinity of the enclosure and/or an acoustic transducer sensitive to acoustic vibrations within a pre-determined frequency range and/or volume.

In order to ensure that the safety systems do not operate when the enclosure is opened normally for use there may further be provided light sensitive means for detecting when the enclosure is open, the light sensitive means being operable to inhibit the said transducers and sensors when the illumination within the enclosure exceeds a predetermined threshold. A time delay on the inhibition will also prevent triggering of the sensors if the door should be slammed shut therefore generating a

vibration which might be above the threshold of the acoustic transducer. The pressure sensitive trigger, because it can have no such inhibition must be provided with a threshold which is greater than that generated by closure of the door.

The present invention may also be considered to comprehend a shock wave detector comprising a plunger, means biasing the plunger axially and means for resisting axial displacement of the plunger comprising a flexible laminar element defining a curved surface supported on the convex face by a rigid support allowing the passage of shock waves or ambient pressure variations whereby to cause the flexible laminar element to move away from the support to curve in the opposite direction thereby releasing the plunger to move under the action of the said biasing means.

In a preferred embodiment of the invention, the plunger controls a valve for the release of a contaminating dye.

Embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of an automatic teller machine illustrating the positioning of the cassettes in which the bank notes are housed within the machine;

Figure 2 is a perspective view of a single cassette typical of those used in such machines;

Figure 3 is a schematic side view illustrating the positioning of the contaminating apparatus of the present invention within the machine illustrated in Figure 1;

Figure 4 is an end view of the contaminating apparatus of the present invention;

Figure 5 is a view from above of the contaminating apparatus illustrated in Figure 4;

Figure 6 is an axial sectional view of a pressure sensitive trigger formed as an embodiment of the invention, illustrated in a first, or "armed" condition of use;

Figure 7 is a sectional view similar to that of Figure 6, showing the trigger in a released condition; and

Figure 8 is an end view, similar to that of Figure 4, showing an alternative embodiment of the contaminating apparatus.

Referring now to the drawings, an automatic teller machine (hereinafter ATM) is generally indicated with the reference numeral 11. Such machines, as is known, are typically housed in the secure environment of a bank or building society office, and positioned with an access opening 12 available through a solid wall. The access opening 12 is provided with a keyboard 13 and a delivery slot 14 through which bank notes are delivered in use of

the machine when an appropriate code is entered on the keyboard 13. Usually a user authorisation element such as a credit card is also required to enable the operation of the machine 11.

Within the secure environment the machine 11 has an access door 15 for loading and unloading the machine, and within the casing 16 of the machine 11 there are a plurality of individual cassettes 17, 18, 19 removably held on racks (not shown) to allow the cassettes to be removed for refilling. A delivery mechanism, generally indicated 20, but not illustrated in detail, acts to withdraw the bank notes from the cassettes as appropriate and to deliver them through the outlet 14 upon receipt of control signals from a computer to which the apparatus is connected by a land line (not illustrated).

Figure 2 illustrates an individual cassette for the bank notes. This comprises an elongate secure casing 21 typically about eighteen inches long by six inches wide and five inches high. The casing 21 has two elongate parallel ribs 22 for engagement on the rack within the machine 11 and a cover 23 hingedly connected at one end 24 to the casing 21 and closable by means of a catch 25 at the other end 26 of the casing 21. At the end wall 26 the casing 21 is provided with a handle 27 for carrying the cassette. Although not visible in Figure 2, the end 24 of the cassette casing 21 has an opening through which

the bank notes may be withdrawn by the delivery mechanism (not illustrated). The cover 23 is provided with an opening 28 adjacent the catch 25 which communicates with the upper interior volume within the cassette above any bank notes which may be loaded in the cassette 6F5.

As can be seen in Figure 3 the cassettes 17, 18, 19 in position within the machine 11 are engaged by dye contamination apparatus generally indicated 29 located between the cassettes and the closure door 15.

As can be seen in Figures 4 and 5 the contamination apparatus 29 comprises two reservoir cylinders 31, 32 supported parallel to one another with their axes substantially vertical and held between two arms 33, 34 to which the cylinders are fixed such as by welding. The arms 33, 34 are each L-shape and pivotally connected by respective pivots 35, 36 to the side wall of the housing 11. By having cranked arms 33, 34 it is possible to pivot the contamination apparatus 29 entirely away from the cassettes 17, 18, 19 when the door 15 is open so as to leave unrestricted access for the normal loading operations.

Between the cylinders 31, 32 is located a sensor 30 connected to a valve 37 in a delivery tube 38 connected by a T-branch 39 to each of the cylinders 31, 32. The outlet from the valve 37 leads to a delivery tube 40

having a plurality of nozzles 41 spaced along its length at positions such as to align with the apertures 28 in the cassettes 17, 18, 19 and enter the cassettes through these apertures when the contamination apparatus 29 is in the position of use illustrated in Figure 3, in which position it is retained by a catch illustrated schematically in Figure 3 and identified by the reference numeral 42. Alternatively the contamination apparatus 29 may be of such a size that it completely fills the space between the cassettes 17, 18, 19 and the door 15 so that the door 15 holds it in position when closed avoiding the necessity for the catch 42.

The sensor 30 may be an entirely mechanical pressure sensor such as that described hereinafter in relation to Figures 6 and 7, which detects any shock waves such as may be generated by an explosive, and operates entirely mechanically to open the valve 37 and allow contaminating dye fluids, which may be a liquid and/or gas to pass from the reservoir cylinders 31, 32 through the distribution tubes 39, 38 into the delivery tube 40 and from there through the nozzles 41 into the individual cassettes 17, 18, 19.

In order to detect attempts to open the housing 11 other than by explosive, for example by drilling, wedges, thermal cutting or the like, there is provided a secondary sensor 43 incorporating an acoustic transducer

and temperature sensor (not individually shown) and powered by a self-contained battery. The sensor 43 is operable, when triggered, to detonate a small explosive charge 44 the 6F5 shockwave from which is detected by the sensor 30 to release the valve 37 in the same way as it does upon detection of an attempt to enter the safe by explosive means.

Although the nozzles 41 are illustrated as narrow elongate nozzles which fit into the openings 28 in the cassette lids 23, alternative nozzles may be provided in which a conical tip engages and seals the opening 28 to ensure a secure coupling.

Referring now to Figures 6 and 7 of the drawings; the trigger shown is adapted to be secured to a source of compressed gas for release into the interior of an ATM or safe when the trigger is released. A central plunger shaft 111 is axially slidable within a plunger body 112. At one end of the plunger shaft 111 there is an enlarged plunger of valve head 113 engaged, as shown in Figure 6, within a valve port 114 of a valve body 115 having a threaded opening 116 for attachment to the source of compressed gas and dye. The valve head 113 has a seal 118 sealing it within the valve port 114 and closing communication between the valve port 114 and a valve chamber 119 within the valve body 115. The valve body 115 is screwed onto the plunger body a radial flange 120

of which engages the end face of the valve body 115. An O-ring seal 121 seals the plunger shaft 111 within a bore 122 within the plunger body 112. The plunger body 112 to the right (as viewed in Figure 6) of the radial flange 120 and the valve body 115 has a circular cross-section. To the left of the radial flange 120 of the plunger body 112 is a projecting boss 123 which has a rectangular or square cross-section.

At the end of the plunger shaft 111 opposite the valve head 113 is a rectangular plunger body 124 secured in place by a nut 125 threadedly engaged on a threaded section 126 of reduced diameter at the end of the plunger shaft 111 projecting from a shoulder 127 thereof against which the plunger 124 is engaged.

A support member 128 is secured to the projecting boss 123 by a screw 129. This support member 128 comprises an elongate limb 128a and a transverse terminal flange 129a. The elongate limb 128a is curved along its length with a very slight curvature, that is one having a long radius of curvature. The precise radius of curvature may vary as will be described hereinbelow. Engaged over the boss 123 and the support 128 is a tubular trigger casing 130 having a square or rectangular cross-section secured to the boss 123 by a pair of screws 131 (only one of which is visible in the drawings).

The tubular casing 130 has a rectangular cross-section and defines a cavity 132 largely closed at one end by the transverse flange 129a of the support member 128 and at the other end by the plunger body 112. Within the cavity 132 is located a flexible laminar element 133 engaged at one against a shoulder of the plunger 124 and at the other end in a groove formed in the transverse flange 129a. As mentioned above, the limb 128a of this support 128 is curved along its length such that it is concave towards the cavity 132. A longitudinal force applied to the flexible laminar element 133 by the plunger 124, therefore, causes the laminar element 133 to flex to adopt the curvature of the support 128a. Although this curvature is too small to be represented in the drawings, it can be adjusted by lateral displacement of the flange 129a, and for this purpose a small gap 134 between the free end of the flange 129a and the adjacent wall of the tubular casing 130 has been left.

Finally, the limb 128a of the support member 128 and the adjacent wall of the tubular trigger casing 130 are provided with aligned apertures identified as 135a, 136a and 137a in the wall of the tubular casing 130 and 135b, 136b and 137b in the limb 128a of the support member 128.

In operation of the trigger described hereinabove the valve body 115 is screwed by the coupling 116 to a source of compressed gas and dye (such as one of the cylinders

31, 32 of Figure 4) such that the valve head 113 is exposed to the gas pressure thereby creating a biasing force longitudinally of the plunger shaft 111 which is transmitted via the plunger 124 to the laminar element 133 causing this to adopt the curved shape of the support limb 128a. This assembly is housed, as described hereinabove, at any convenient location within a secure closure such as a safe or ATM. Any attempt to force open the safe or ATM by the use of explosives will cause a shock wave and consequently a rapid transient increase in pressure which, regardless of its initial direction of movement, enters the apertures 135a, 136a and 137a and thereby causes deflection of the laminar element 133. Because the radius of curvature of this element is very great it requires only a very small lateral deflection to displace it from its support position to adopt a curvature in the opposite sense which is unsupported. The longitudinal biasing force exerted by the plunger 124 therefore continues to displace the laminar element 133 to the position illustrated in Figure 7 where it is flexed inwardly of the cavity 132 allowing the plunger shaft 111 to move to the left displacing the valve head 113 from the port 114 and opening this to allow communication via the valve chamber 119 from which it can escape through the outlet port 117 via any ducts which may be provided to distribute the gas and contaminating dye onto the valuable contents of the safe, or to the bank notes in an ATM, thereby rendering them valueless.

It will be appreciated that the cavity 132 is not closed from the atmosphere by the casing 130, and in particular communicates with the atmosphere through the opening 134. This allows relatively slow changes in ambient pressure, such as that caused by slamming shut the door, to be ignored by the trigger, which only responds to the rapid pressure change caused by an explosion.

As mentioned above, the trigger may also be used in a more sophisticated security system in which sensors responsive to other physical parameters such as sound or attempted movement can be used to detonate a very small explosive charge to generate a shock wave sufficiently great to release the trigger and thereby contaminate the contents of the safe or ATM.

The alternative embodiment of Figure 8 is similar to that of Figure 4 and those components which fulfil the same or corresponding functions are identified with the same reference numerals raised by 200. Thus the contaminant dye is stored in a pressure cylinder 232 and can be released via a valve 237 upon triggering of a trigger 230, to delivery dye through a delivery pipe 239 to a distribution pipe 240 having a plurality of nozzles 241 which, as in the embodiment of Figure 4, can be introduced into openings into respective cassettes within the enclosure.

The distribution pipe 239 also acts as the mounting arm for the delivery pipe 240 and is pivotally connected at a pivotal connection 236 to a mounting bracket 250. A further, upper, arm 260 carrying the upper end of the delivery pipe 240 is pivotally connected at 235 and upper bracket 251. The upper and lower brackets 251 and 250 can be secured to the enclosure in a permanent, fixed manner, and location of the delivery pipe 240 can be insured by means of two abutment plates 252, 253 carried on the arms 239, 260 respectively, which engage cooperating plates (not visible in the drawings) carried by the brackets 250, 251 respectively. These plates can be locked together by locks 254, 255 when in the operating position shown in Figure 8.

This provides a further degree of security since, even if the enclosure should be forced open before the whole of the contents of the cylinder 232 have been delivered through the nozzles 241, it is not possible simply to swing the delivery pipe work out of communication with the openings in the cassettes until the locks 254, 255 have been released: this slows down the access to the cassettes ensuring that the contaminating dye can throughly saturate the contents thereby securely contaminating them before the cassettes can be removed from the enclosure.

It will be appreciated that in this embodiment the

cylinder 232 is located at a fixed position to one side of the cassettes rather than being pivoted into and out of position as in the embodiment of Figure 4.

CLAIMS

1. Apparatus for contaminating valuables such as bank notes or other documents held in one or a plurality of containers removably mounted within a housing, by delivering contamination material into each container from a reservoir thereof via a contaminant delivery system when a valve is opened, in which the housing is a lockable secure enclosure, the reservoir and the delivery system are housed wholly within the said secure enclosure but outside the or each said container, and a sensor for detecting forced entry into the housing is located within the said secure enclosure and operable, when triggered by an attempt at forced entry into the housing, automatically to open the said valve and release contaminant into the or each individual removable container whereby to contaminate the contents thereof.

2. Apparatus as claimed in Claim 1, in which the sensor is entirely mechanical and requires no electrical or other power supply.

3. Apparatus as claimed in Claim 1 or Claim 2, in which the contaminant delivery system is entirely mechanical and requires no electrical or other power supply.

4. Apparatus as claimed in any of Claims 1 to 3, in

which the contaminant delivery system has a plurality of outlets for rapid distribution of contaminant fluid to a plurality of containers or cassettes within the main enclosure.

5. Apparatus as claimed in Claim 4, in which the delivery system includes a plurality of nozzles each adapted to delivery contaminant fluid from a common source through an opening in the associated container or cassette.

6. Apparatus as claimed in any preceding claim, in which the contaminant delivered by the system is a liquid orgaseous dye such a non-drying dye capable of impregnating a porous material; an adhesive or glue, such as a rapid drying glue, or a chemical agent which will destructively attack the material to render it valueless.

7. Apparatus as claimed in any preceding claim including a reservoir in which the dye is held under pressure, and a mechanically actuated valve releasable upon detection of an event indicating an attempt at forcible entry into the enclosure whereby quickly to deliver a large quantity of contaminating fluid into the said containers or cassettes .

8. Apparatus as claimed in Claim 7, in which there are provided means for automatic coupling of the delivery

nozzles to the containers or cassettes upon repositioning of the containers or cassettes, or the contaminating system, within the enclosure prior to closing an openable closure thereof.

9. Apparatus as claimed in Claim 8, in which the contaminating system is located within the enclosure in a position such that the nozzle or nozzles thereof is or are contacted by an opening in the container(s) or cassette(s) as this or these is or are positioned in the enclosure.

10. Apparatus as claimed in Claim 7 or Claim 8 or Claim 9, in which the movable dye delivery system is located between the container(s) or cassette(s) and an openable closure of the enclosure.

11. Apparatus as claimed in Claim 10 in which the contaminating system is permanently connected to the casing of the enclosure, such as by hinges, and displaceable between a working position and a withdrawn position in which latter it allows removal of the container(s) or cassette(s) but obstructs closing of the closure member.

12. Apparatus as claimed in any of Claims 8 to 11, in which the nozzle or nozzles for connection to the container(s) or cassette(s) is or are formed as conically

tapered nozzle or nozzles which automatically align with the opening(s) in the container(s) or cassette(s) upon repositioning of the container(s) or cassette(s) or the dye delivery system as appropriate.

13. A pressure sensitive trigger comprising a flexible laminar element held in a curve in a first direction by support means engaging the convex face of the element whereby to resist further curvature due to a biasing force exerted longitudinally of the element by biasing means, and means for shielding the concave face of the element from ambient pressure variations such that an increase in ambient pressure beyond a threshold value determined by the characteristics of the laminar element and the value of the said biasing force causes the laminar element of flex in the opposite direction thereby releasing it from the support and allowing displacement of the biasing means.

14. A pressure sensitive trigger as claimed in claim 13, in which the flexible laminar element is an elongate strip.

15. A pressure sensitive trigger as claimed in claim 14, in which the flexible laminar element is made of a resilient plastics material.

16. A pressure sensitive trigger as claimed in claim 15,

in which the flexible laminar element is made of a flexible metal (e.g spring steel).

17. A pressure sensitive trigger as claimed any of Claims 13 to 16, in which the means for shielding the concave face of the flexible laminar element from ambient pressure variations comprises an enclosure defining a cavity of which the said concave face defines one wall on a part thereof.

18. A pressure sensitive trigger as claimed in claim 17, in which the enclosure comprises a casing surrounding the flexible laminar element and having openings communicating with the convex face thereof

19. A pressure sensitive trigger as claimed in any of Claims 13 to 18, in which the support means comprises a separate element from the said shielding means.

20. A pressure sensitive trigger as claimed in any of Claims 13 to 19, in which the support means comprises a perforated, mesh or otherwise pierced member.

21. A pressure sensitive trigger as claimed in any of claims 19 or 20, in which the support means in removable from the casing.

22. A pressure sensitive trigger as claimed in any of

Claims 13 to 21 in which the said biasing means comprise a resilient biasing member.

23. A pressure sensitive trigger as claimed in any of claims 13 to 21, in which the said biasing means comprise a compressed gas acting on one end of a plunger or piston the other end of which engages the said flexible laminar element.

24. A pressure sensitive trigger as claimed in any of Claims 13 to 24, in which the force exerted by the biasing means is adjustable to vary the sensitivity of the trigger.

25. A pressure sensitive trigger as claimed in any of Claims 13 to 24, in which the curvature of the flexible laminar element is variable to vary the sensitivity of the trigger.

26. A security system for an enclosure intended to house valuables including a mechanical pressure sensitive trigger as claimed in any of Claims from 13 to 25, operable to trigger release of a contaminant dye to devalue the contents of the enclosure upon deletion of an increase in ambient pressure beyond the said threshold value.

27. A security system as claimed in claim 26, further

including means for detecting other physical parameters and operable to detonate an explosive charge upon detection thereof whereby to inihate operation of the pressure sensitive trigger.

28. A security system as claimed in claim 27, in which the means for detecting other physical parameters includes means sensitive to movement of the enclosure.

29. A security system as claimed in Claim 27, in which the means for detecting other physical parameters includes means sensitive to temperature within or in the vicinity of the enclosure.

30. A security system as claimed in Claim 27, in which the means for detecting other physical parameters includes an acoustic transducer sensitive to acoustic vibrations within a predetermined frequency range and/or volume.

31. A security system as claimed in any of Claims 27 to 30, in which there are further provided light-sensitive means for detecting when the enclosure is open, operable to inhibit the said transducers and sensors when the illumination within the enclosure exceeds a predetermined threshold.

32. A shock wave detector comprising a plunger means

biasing the plunger and means for resisting axial displacement of the plunger comprising a flexible laminar element defining a curved surface supported on the convex face by a rigid support allowing the passage of shock waves or ambient pressure variations whereby to cause the flexible laminar element to move away from the support to curve in the opposite direction thereby releasing the plunger to move under the action of the said biasing means.

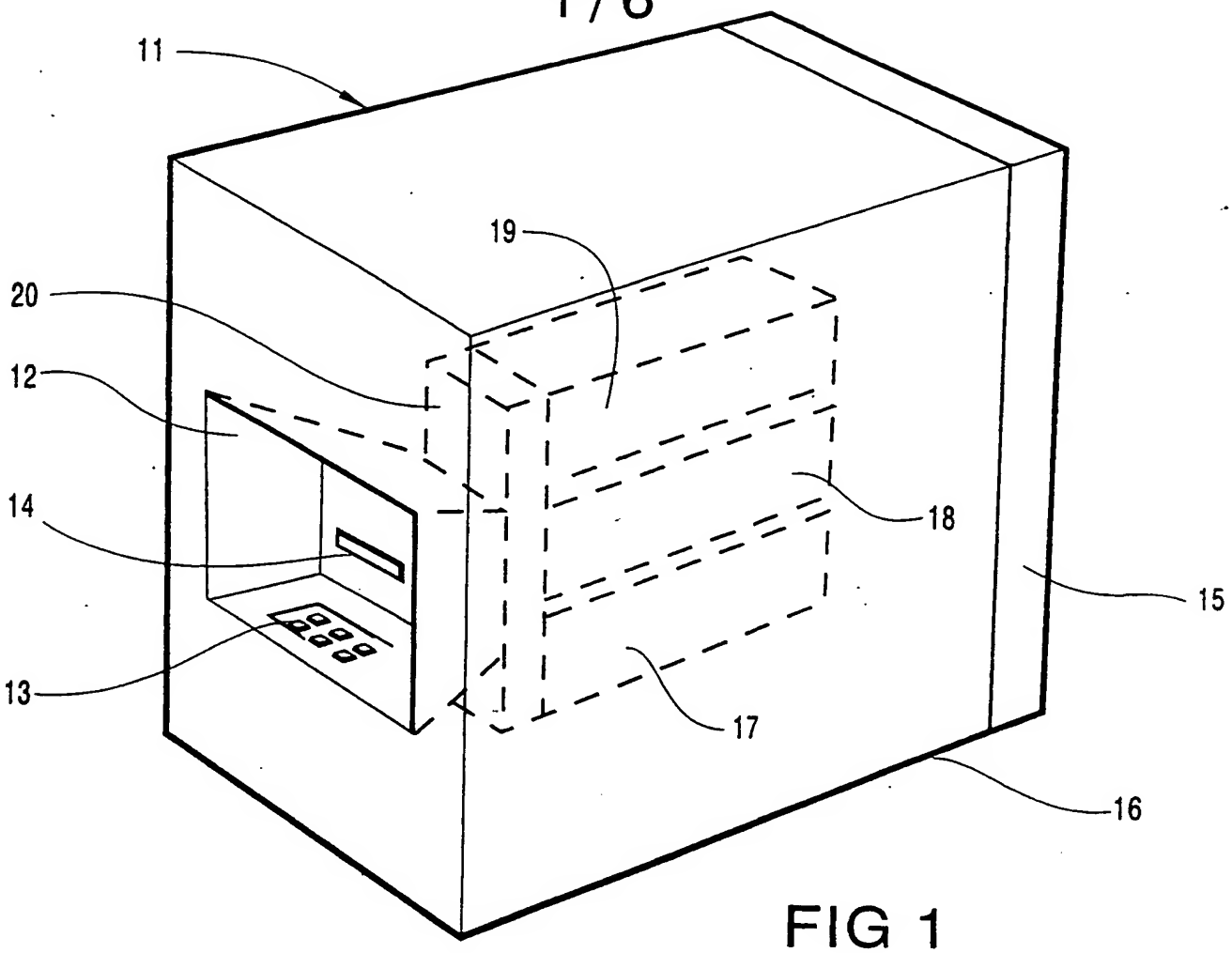


FIG 1

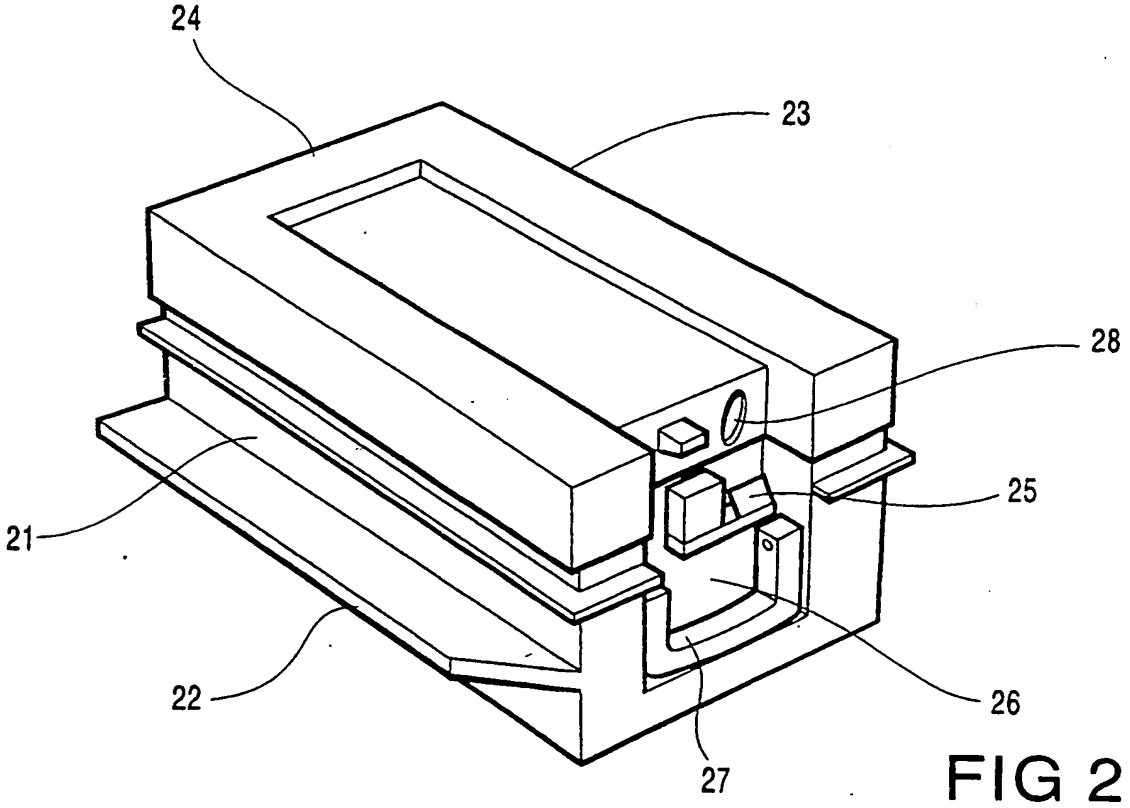
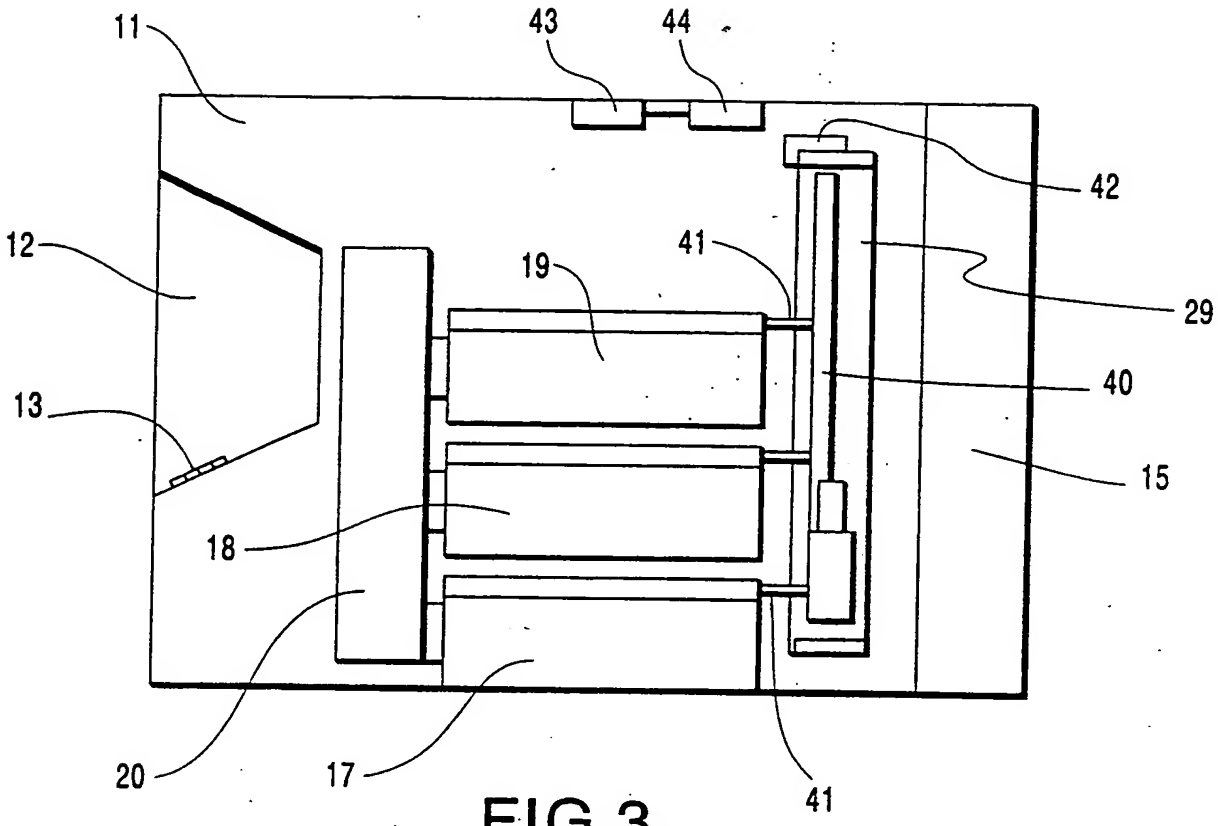


FIG 2



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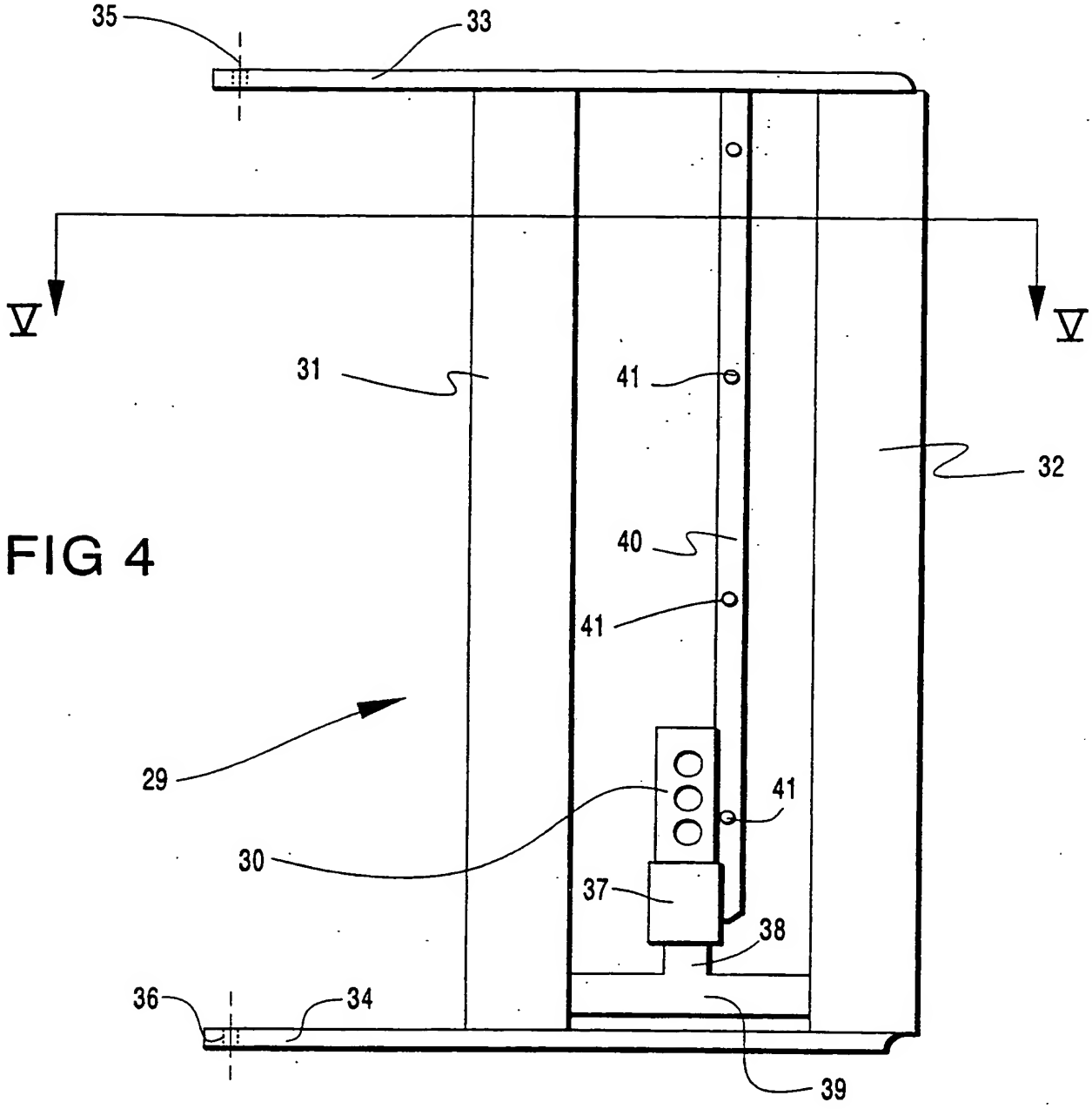

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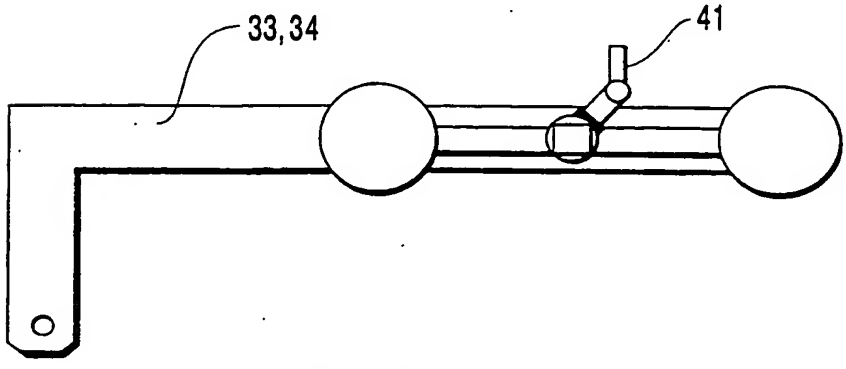

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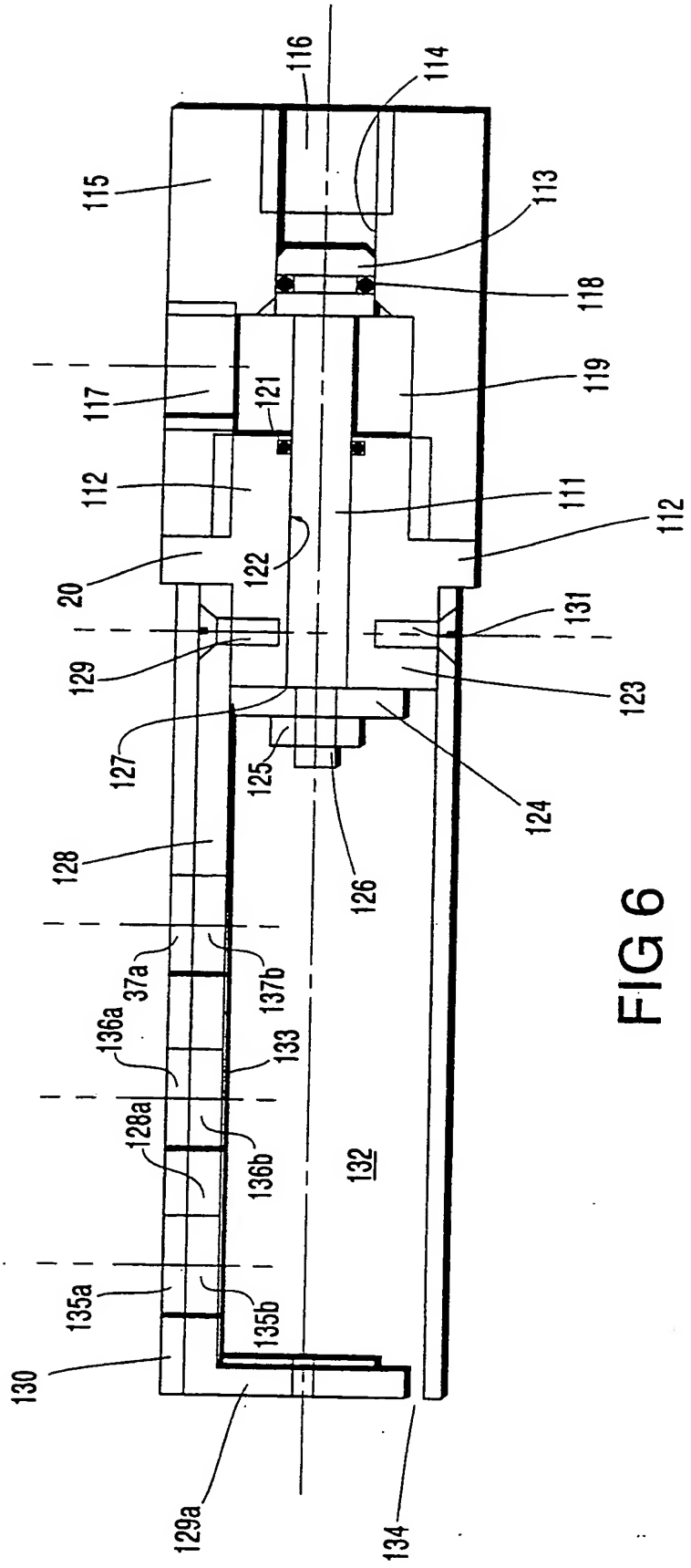
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FIG 6

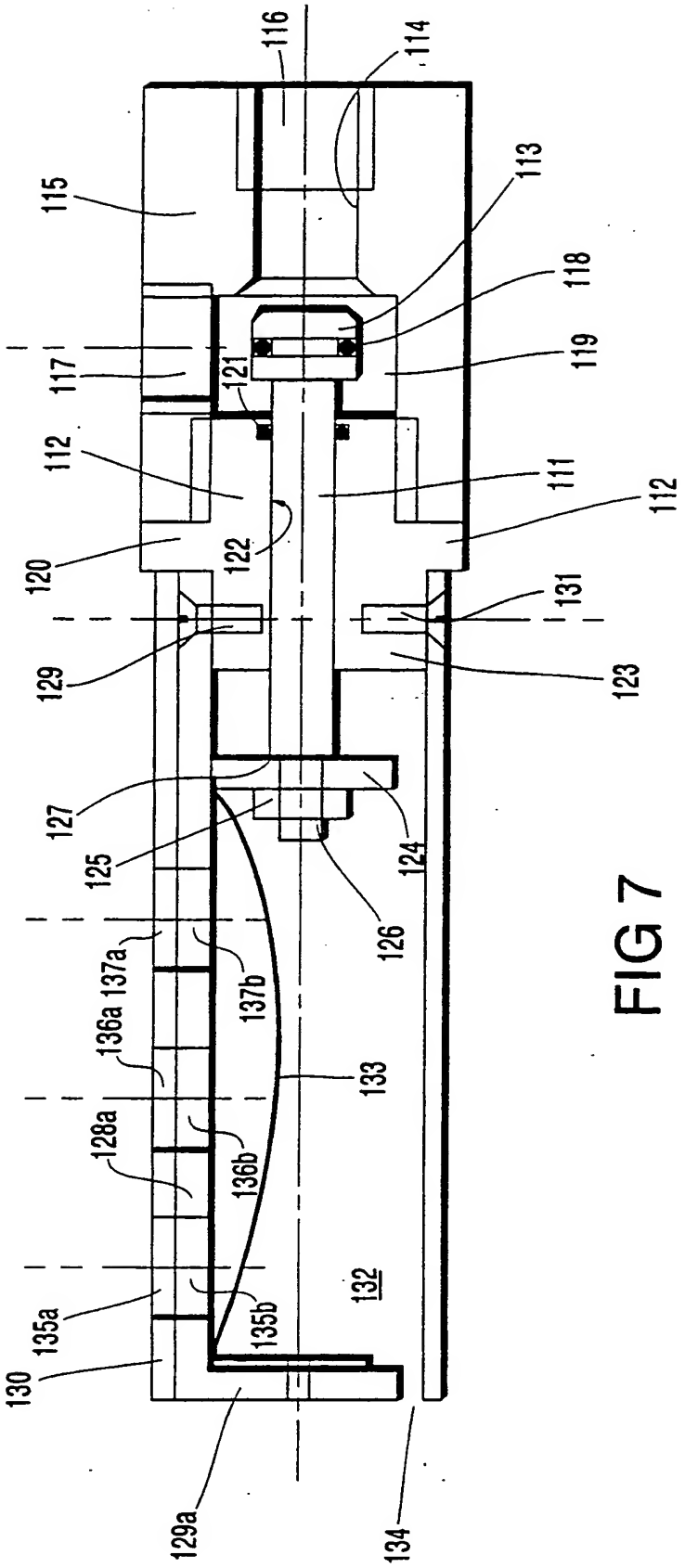
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FIG 7

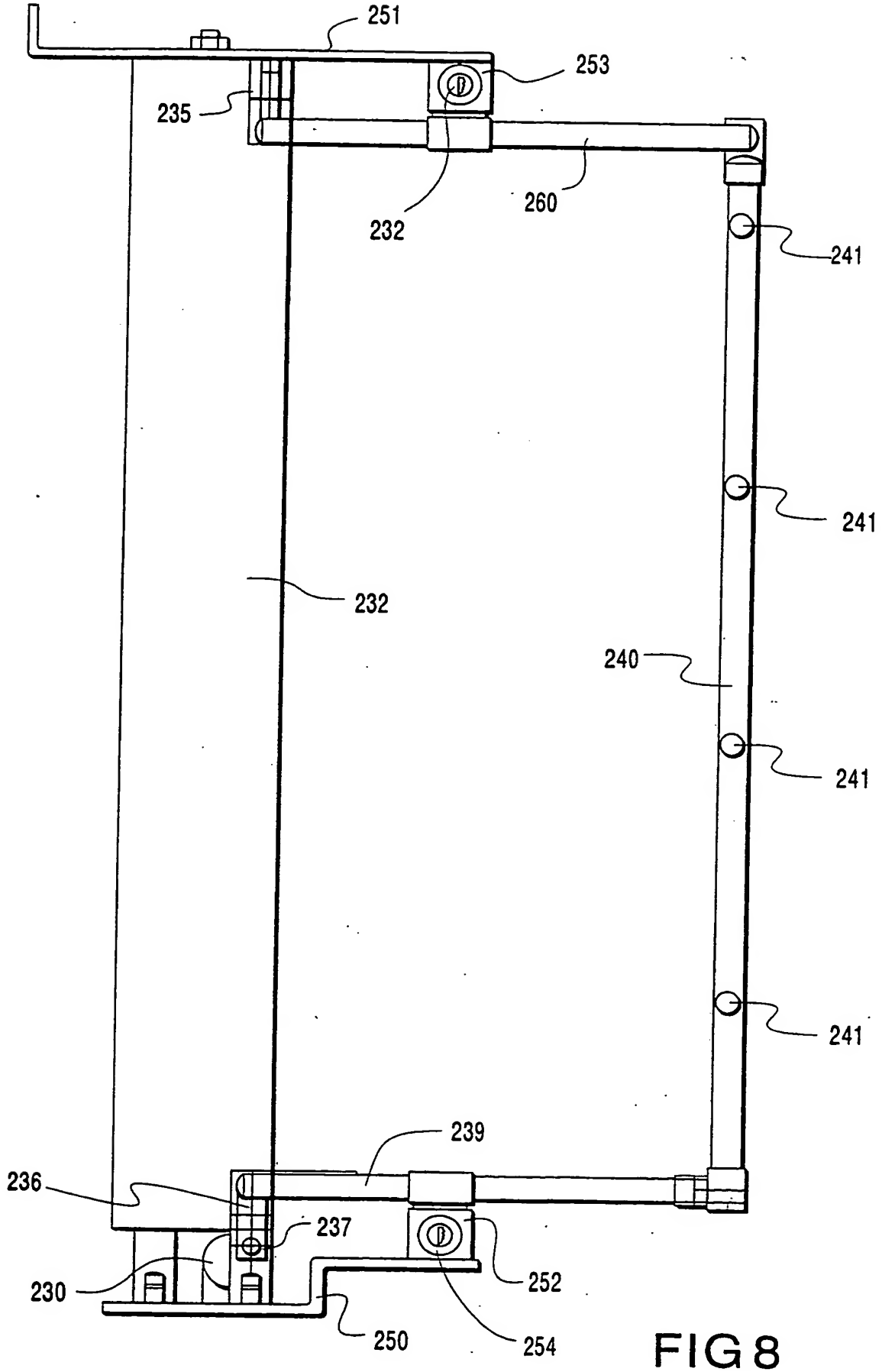
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FIG 8

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 92/01334

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 G08B15/02; E05G1/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	G08B ; E05G

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	WO,A,8 100 043 (MILLAR F.) 22 January 1981 see abstract	1
X	CH,A,592 230 (J. SCHUTZ) 14 October 1977 see the whole document	1
A	FR,A,2 617 530 (COUDERQ Y.) 6 January 1989 see claims 1-5	1
A	EP,A,0 232 632 (BULL S. A.) 19 August 1987 see claims 1,10	1
A	EP,A,0 166 639 (OLIVARES ALBACETE M.) 2 January 1986 see abstract	1

° Special categories of cited documents :[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
30 OCTOBER 1992	13. 11. 92
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	SGURA S.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 9201334 SA 63212

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 30/10/92

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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		AU-A-	5999180	03-02-81
		DE-C-	3049678	30-07-92
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		NL-T-	8020273	29-04-81
		US-A-	4391203	05-07-83
CH-A-592230	14-10-77	None		
FR-A-2617530	06-01-89	None		
EP-A-0232632	19-08-87	FR-A,B	2572907	16-05-86
EP-A-0166639	02-01-86	None		